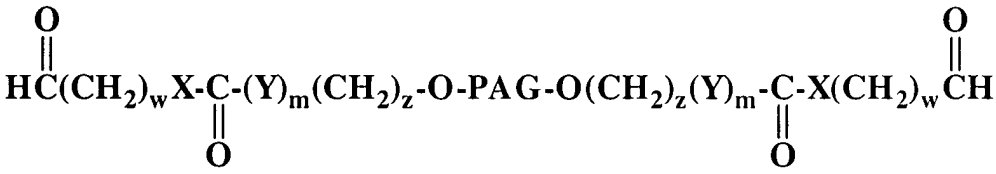
What is Claimed:

1. An aldehyde having the formula:



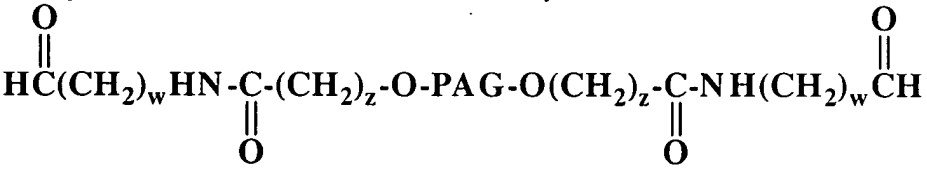
IA

wherein X and Y are individually selected from –O - or -NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from about 500 to about 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8, wherein the aldehyde group is free or protected with a hydrolyzable aldehyde protecting group.

2. The aldehyde of claim 1 wherein said residue is formed from polyethylene glycol.

3. The aldehyde of claim 2 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

4. The aldehyde of claim 1 wherein said aldehyde has a formula:



IA-1

wherein PAG, z, and w are as above.

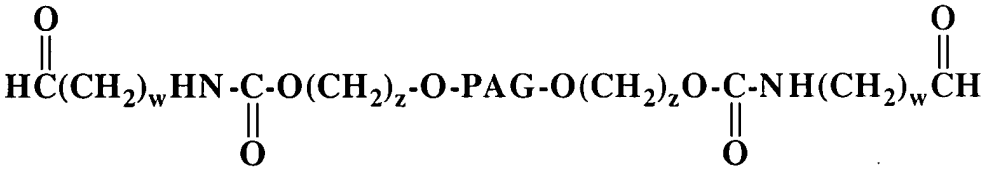
5. The aldehyde of claim 4 wherein said divalent residue is polyethylene glycol.

6. The aldehyde of claim 5 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

7. The aldehyde of claim 5 wherein the molecular weight of the residue is about 10,000 Daltons.

8. The aldehyde of claim 5 wherein the molecular weight of the residue is about 20,000 Daltons.

9. The aldehyde of claim 1 wherein said aldehyde has a formula:



IA-2

wherein PAG, z and w are as above.

10. The aldehyde of claim 9 wherein said divalent residue is formed from polyethylene glycol.

11. The aldehyde of claim 10 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

12. The aldehyde of claim 10 wherein the said residue has a molecular weight of 20,000 Daltons.

13. The aldehyde of claim 1 having the formula:

IA-3

wherein PAG, z and w are as above.

14. The compound of claim 13 wherein said divalent residue is polyethylene glycol.

15. The compound of claim 14 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

16. The aldehyde of claim 14 wherein the molecular weight of the residue is 20,000 Daltons.

17. The aldehyde of claim 1 having the formula:

IA-4

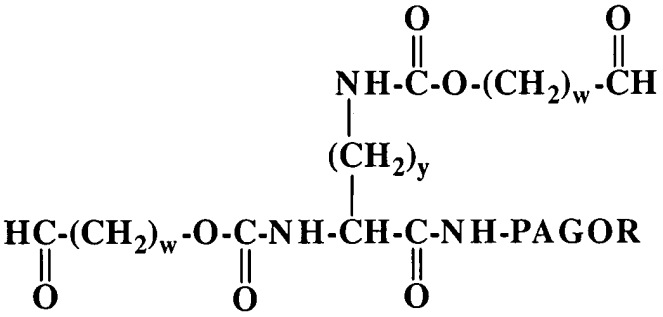
wherein PAG, z and w are as above.

18. The aldehyde of claim 17 wherein said divalent residue is formed from polyethylene glycol.

19. The compound of claim 18 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

20. The aldehyde of claim 18 wherein the molecular weight of the residue is 20,000 Daltons.

21. An aldehyde of the formula:



IB

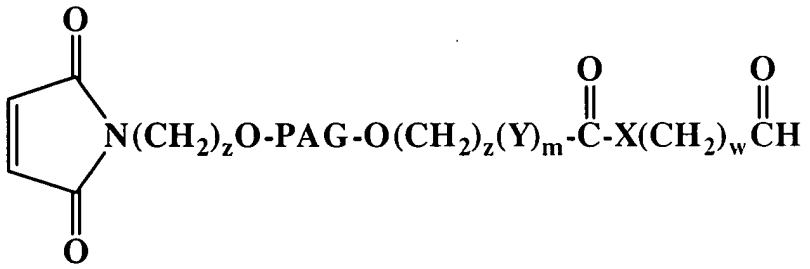
wherein R is hydrogen or lower alkyl, w is an integer from 2 to 8, y is an integer of from 2 to 4, and PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from about 500 to about 100,000 Daltons.

22. The aldehyde of claim 21 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000 Daltons.

23. The aldehyde of claim 22 where R is methyl and the PEG residue has a molecular weight of about 10,000 Daltons.

24. The aldehyde of claim 22 wherein R is methyl and the PEG residue has a molecular weight of 20,000 Daltons.

25. An aldehyde of the formula:



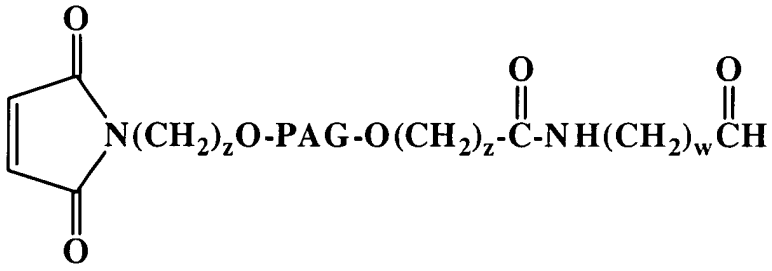
ID

wherein X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

26. The aldehyde of claim 25 wherein said residue is formed from polyethylene glycol.

27. The aldehyde of claim 26 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

28. The aldehyde of claim 25 wherein said aldehyde has a formula:



ID-1

wherein PAG, z and w are as above.

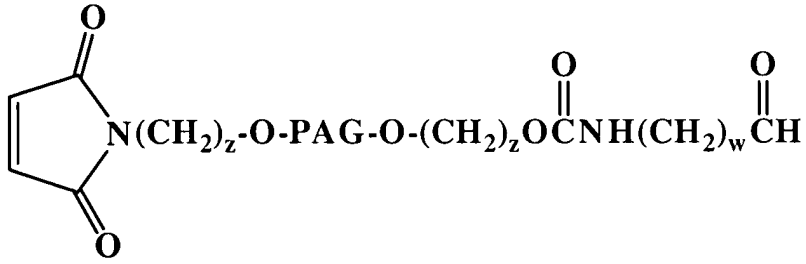
29. The aldehyde of claim 28 wherein said divalent residue is polyethylene glycol.

30. The aldehyde of claim 29 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

31. The aldehyde of claim 29 wherein the molecular weight of the residue is about 10,000 Daltons.

32. The aldehyde of claim 29 wherein the molecular weight of the residue is about 20,000 Daltons.

33. The aldehyde of claim 25 wherein said aldehyde has a formula:



ID-2

wherein PAG, z and w are as above.

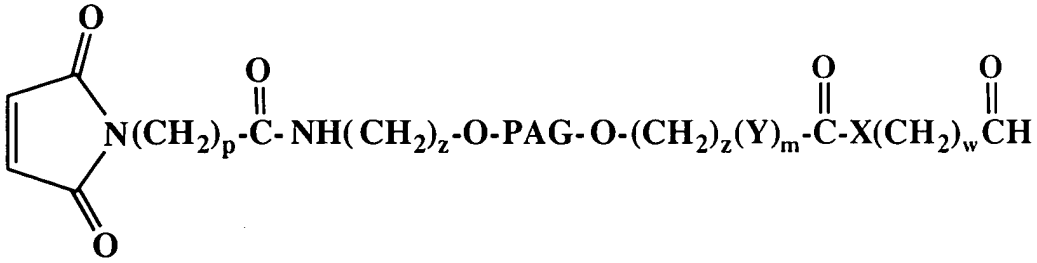
34. The aldehyde of claim 33 wherein said divalent residue is polyethylene glycol.

35. The aldehyde of claim 34 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

36. The aldehyde of claim 34 wherein the molecular weight of the residue is about 10,000 Daltons.

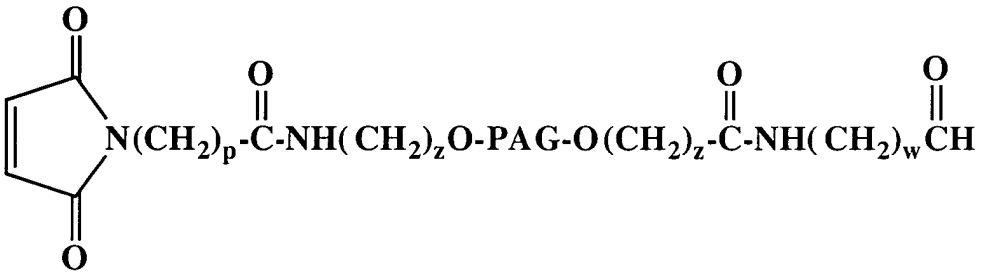
37. The aldehyde of claim 34 wherein the molecular weight of the residue is about 20,000 Daltons.

38. An aldehyde of the formula:



wherein X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, p is an integer of from 1 to 10, and w is an integer of from 2 to 8.

39. The aldehyde of claim 38 wherein said aldehyde has a formula:



E-1

wherein PAG, p, z and w are as above.

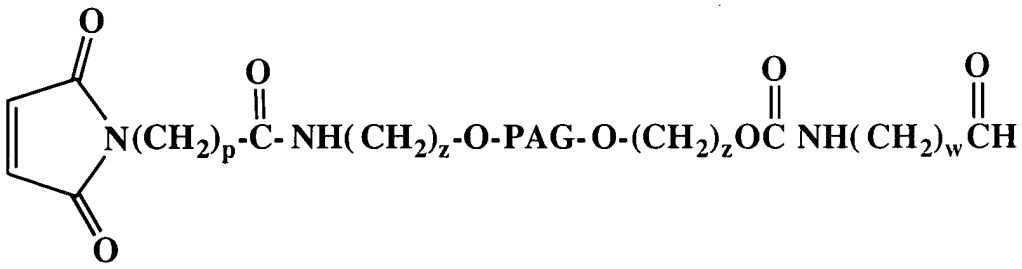
40. The aldehyde of claim 39 wherein said divalent residue is polyethylene glycol.

41. The aldehyde of claim 40 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

42. The aldehyde of claim 40 wherein the molecular weight of the residue is about 10,000 Daltons.

43. The aldehyde of claim 40 wherein the molecular weight of the residue is about 20,000 Daltons.

44. The aldehyde of claim 38 wherein said aldehyde has a formula:



IE-2

wherein PAG, p, z and w are as above.

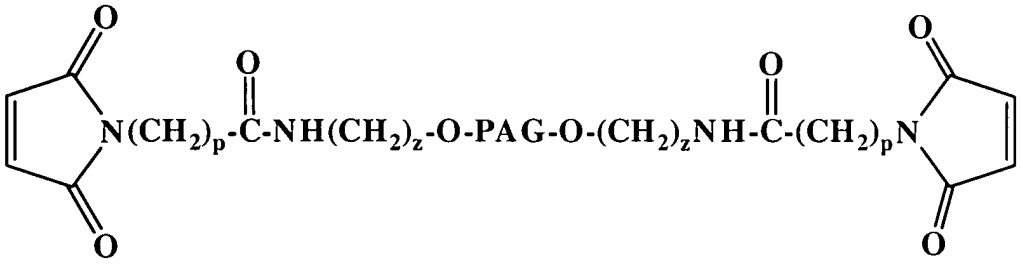
45. The aldehyde of claim 44 wherein said divalent residue is polyethylene glycol.

46. The aldehyde of claim 45 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

47. The aldehyde of claim 45 wherein the molecular weight of the residue is about 10,000 Daltons.

48. The aldehyde of claim 45 wherein the molecular weight of the residue is about 20,000 Daltons.

49. A homobifunctional N-maleimidyl polymer of the formula:



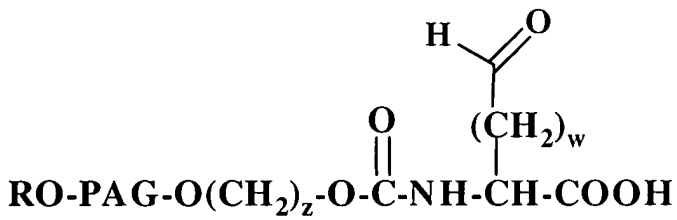
IG

wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and

having a molecular weight of from about 500 to about 100,000 Daltons, p is an integer of from 1 to 10, and z is an integer of from 2 to 4.

50. The compound of claim 49 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000 Daltons.

51. An aldehyde of the formula:

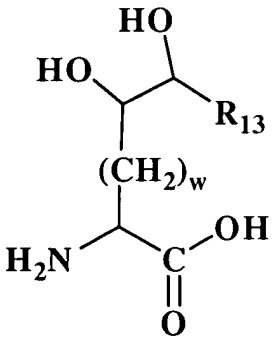


wherein PAG,R, w and z are as above.

52. The aldehyde of claim 51 wherein said residue is formed from polyethylene glycol

53. The aldehyde of claim 52 wherein the residue has a molecular weight of 5,000 to 50,000 Daltons.

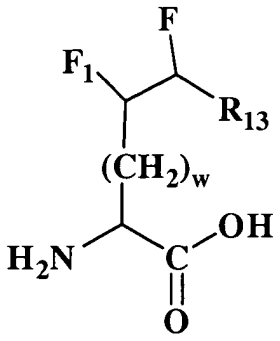
54. The amino acid of the formula:



55.

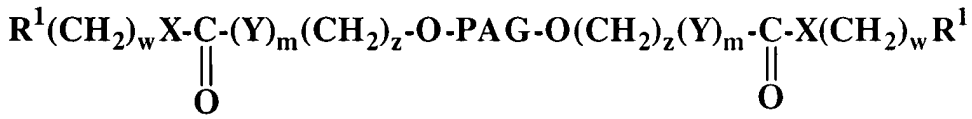
56. wherein R_{13} is hydrogen alkyl, or phenyl and w is an integer of from 2 to 8.

55. The amino acid of the formula:



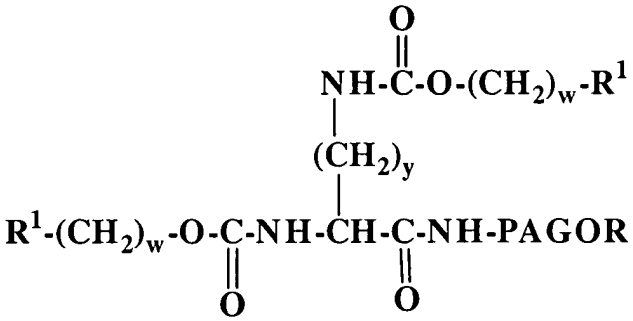
wherein F_1 and F are individually selected from –OH or $–NH_2$ with the proviso that F_1 is $-NH_2$ when F is -OH and F_1 is -OH when F is $-NH_2$. R_{13} and w are as above.

56. A compound of the formula:



wherein R^1 is $CH(OH)CH(OH)R^2$ and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, X and Y are individually selected from –O- or - NH- with the proviso that X is NH when m is 1 and Y is–O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from about 500 to about 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1; and w is an integer of from 2 to 8.

57. A compound of the formula:



wherein R is hydrogen or alkyl, R^1 is -CH(OH)CH(OH)R^2 and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, w is an integer from 2 to 8, y is an integer of from 2 to 4, and PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from about 500 to about 100,000 Daltons.

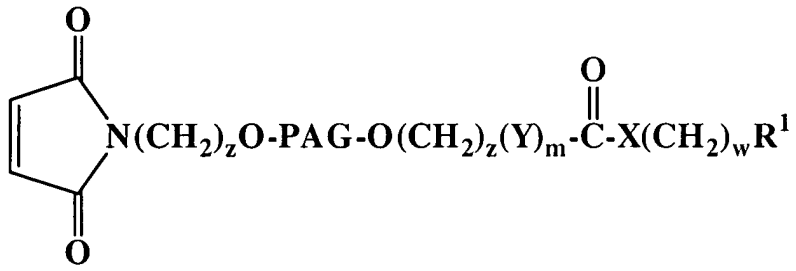
58. A compound of the formula:

$$R^1\text{-}(CH_2)_w\text{-}O\text{-}(CH_2)_zO\text{-}PAG\text{-}O(CH_2)_z\text{-}O\text{-}(CH_2)_w\text{-}R^1$$

wherein R^1 is CH(OH)CH(OH)R^2 and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, w is an integer from 3 to 8, z is an integer of from 2 to 4, and PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a

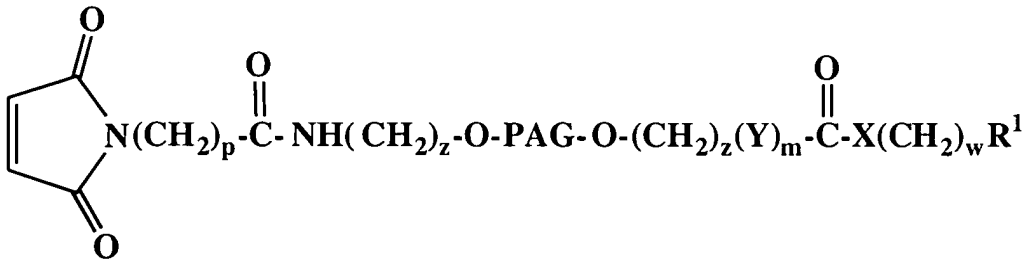
molecular weight of from about 500 to about 100,000 Daltons.

59. A compound of the formula:



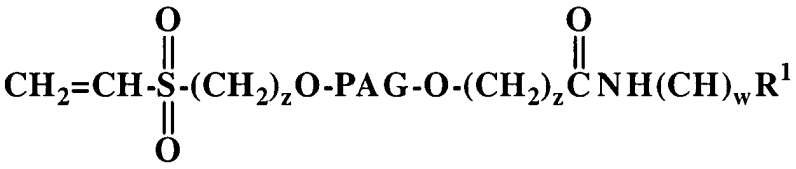
wherein wherein R^1 is CH(OH)CH(OH)R^2 and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, X and Y are individually selected from –O - or -NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

60. A compound of the formula:



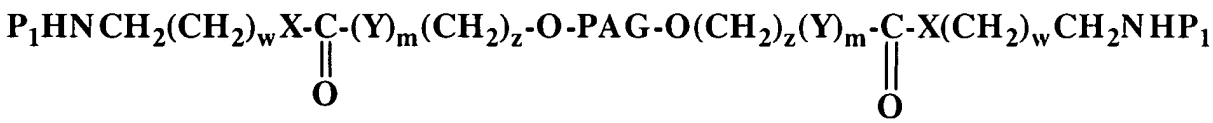
wherein R^1 is $CH(OH)CH(OH)R^2$ and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, p is an integer of from 1 to 10, and w is an integer of from 2 to 8.

61. A compound of the formula:



wherein R^1 is $CH(OH)CH(OH)R^2$ and wherein R^2 is selected from a group consisting of hydrogen, alkyl, or phenyl, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8.

62. A conjugate of the formula:



IIA

wherein P_1 is a protein residue with its amino group removed, X and Y are individually selected from -O- or -NH with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

63. The conjugate of claim 62 where said conjugate has the formula:

IIA-1

wherein P_1, PAG, w and z are as above.

64. The conjugate of claim 63 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

65. The conjugate of claim 64 where said P_1 can be G-CSF, EPO, IFN-•, IFN-• or Hemoglobin.

66. The conjugate of claim 63 where said conjugate has the formula:

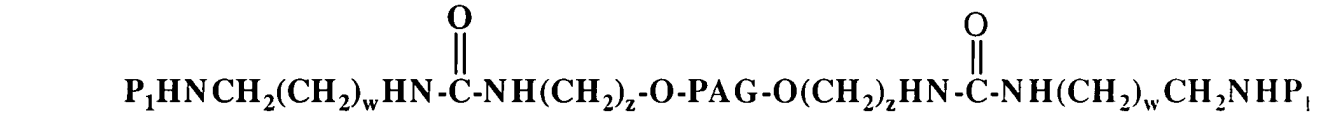
IIA-2

wherein P_1, PAG, w and z are as above.

67. The conjugate of claim 66 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

68. The conjugate of claim 67 where said P_1 can be G-CSF, EPO, IFN-•, IFN-• or Hemoglobin.

69. The conjugate of claim 62 where said conjugate has the formula:



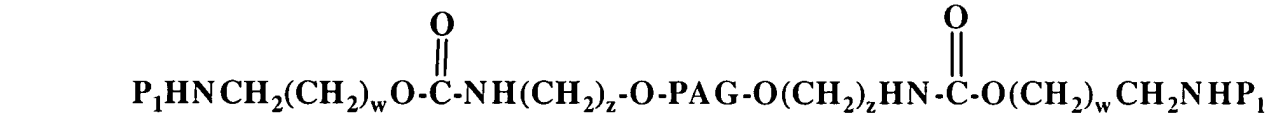
IIA-3

wherein P_1, PAG, w and z are as above,

70. The conjugate of claim 69 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

71. The conjugate of claim 70 where P_1 can be G-CSF, EPO, IFN-•, IFN-• or Hemoglobin.

72. The conjugate of claim 62 where said conjugate has the formula:



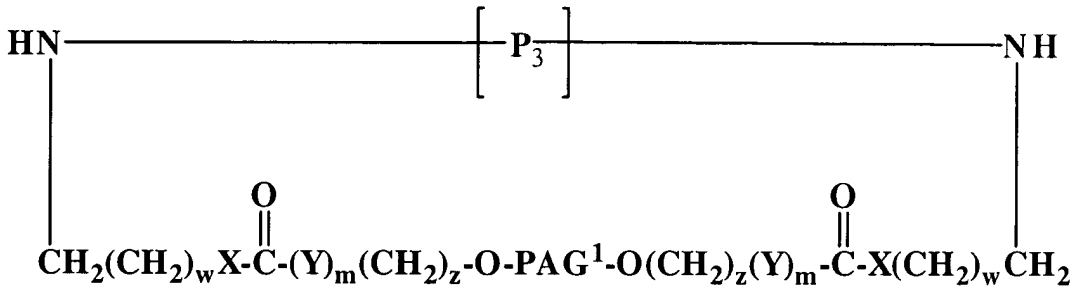
IIA-4

wherein P_1, PAG, w and z are as above.

73. The conjugate of claim 72 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

74. The conjugate of claim 73 where said P_1 can be G-CSF, EPO, IFN-•, IFN-• or Hemoglobin.

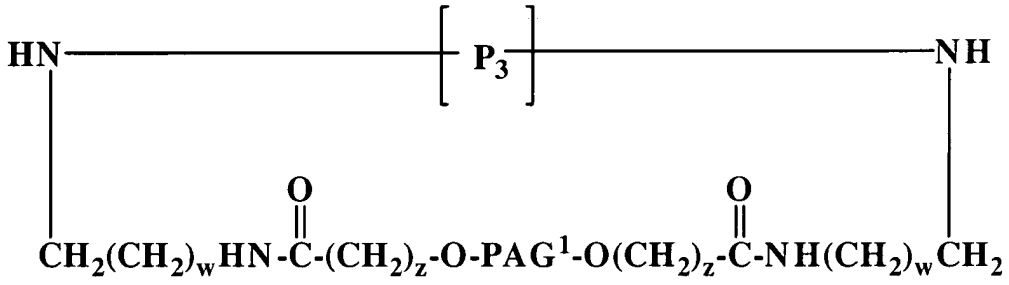
75. A conjugate of the formula:



IIAA

wherein $[P_3]$ is the divalent residue of a protein resulting from removal of two of its primary amino groups, X and Y are individually selected from -O- or -NH with the proviso that X is NH when m is 1 and Y is –O-, PAG^1 is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 20,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

76. The conjugate of claim 75 were said conjugate has the formula:



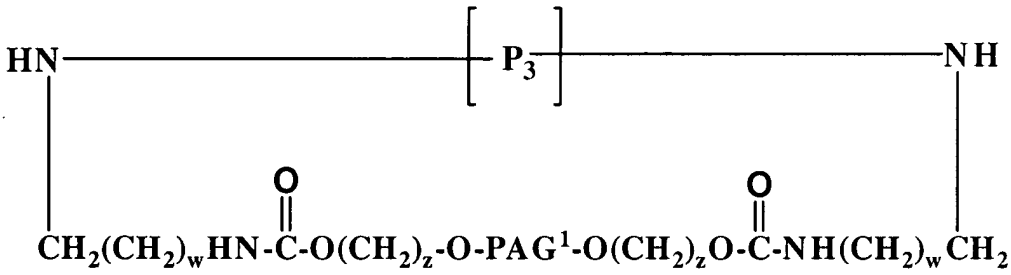
IIAA-1

wherein [P_3], PAG^1, w and z are as above.

77. The conjugate of claim 76 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000

78. The conjugate of claim 77 where said [P_3] is Hemoglobin.

79. The conjugate of claim 75 where said conjugate has the formula:



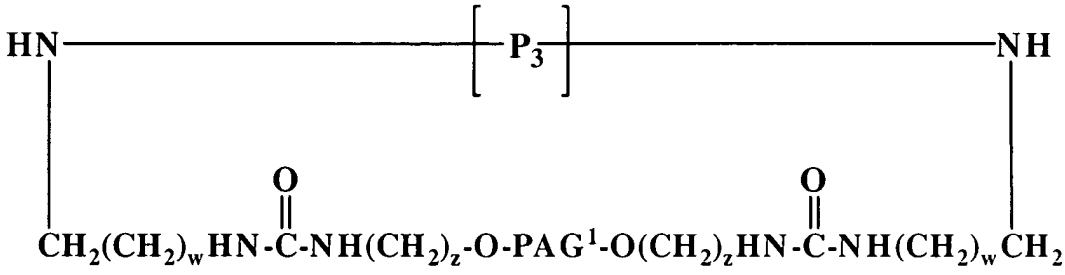
IIAA-2

wherein [P_3], PAG^1, w and z are as above.

80. The conjugate of claim 79 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

81. The conjugate of claim 80 where said [P_3] is G-CSF, EPO, IFN-•, IFN-• or Hemoglobin.

82. The conjugate of claim 75 where said conjugate has the formula:



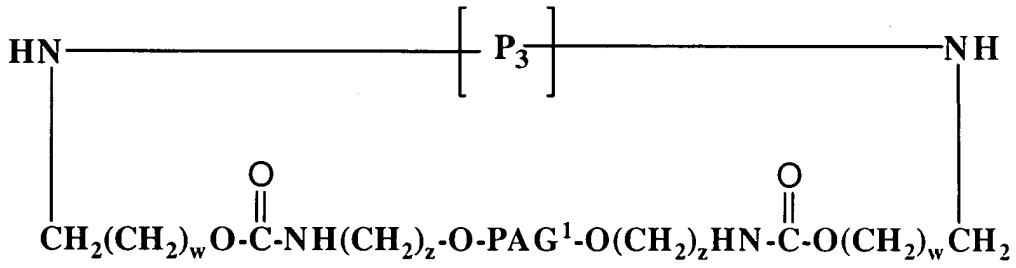
IIAA-3

wherein [P_3], PAG^1, w and z are as above.

83. The conjugate of claim 82 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

84. The conjugate of claim 83 where said [P_3] is Hemoglobin.

85. The conjugate of claim 75 where said conjugate has the formula:



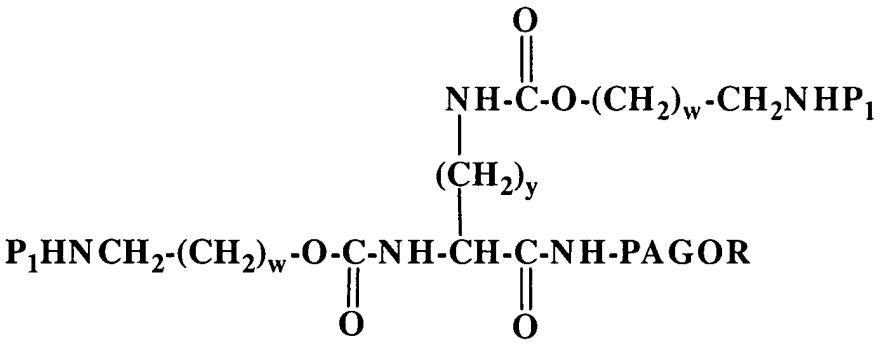
IIAA-4

wherein [P_3], PAG^1, w and z are as above.

86. The conjugate of claim 85 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

87. The conjugate of claim 86 where said [P_3] is Hemoglobin.

88. A conjugate of the formula:



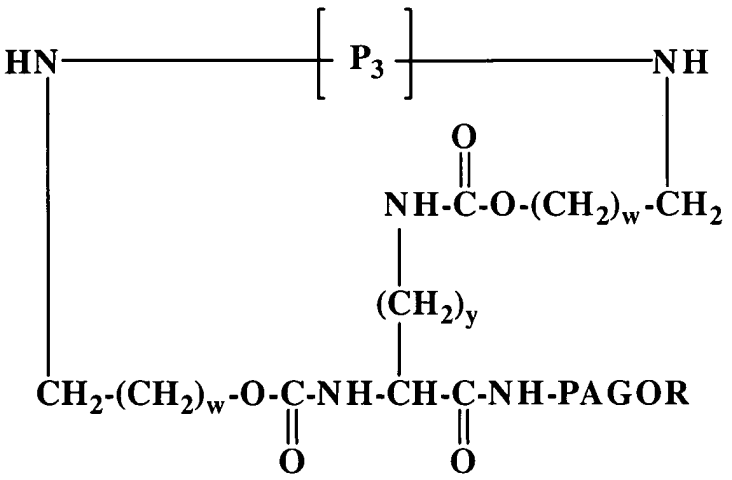
IIB

wherein P_1 is a protein residue with its amino group removed, PAG is a divalent residue of poly lower alkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, R is hydrogen or lower alkyl, w is an integer of from 2 to 8, and y is an integer of from 2 to 4.

89. The conjugate of claim 88 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

90. The conjugate of claim 89 where said P_1 may be G-CSF, EPO, IFN-•, IFN-• or hemoglobin.

91. A conjugate of the formula:



IIBB

wherein [P_3] is the divalent residue of a protein resulting from removal of two of its primary amino groups, R is hydrogen or lower alkyl, PAG is a divalent residue of poly lower alkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, w is an integer of from 2 to 8, and y is an integer of from 2 to 4.

92. The conjugate of claim 91 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

93. The conjugate of claim 92 where said [P_3] is Hemoglobin.

94. The conjugate of claim 93 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 10,000.

95. A conjugate of the formula:

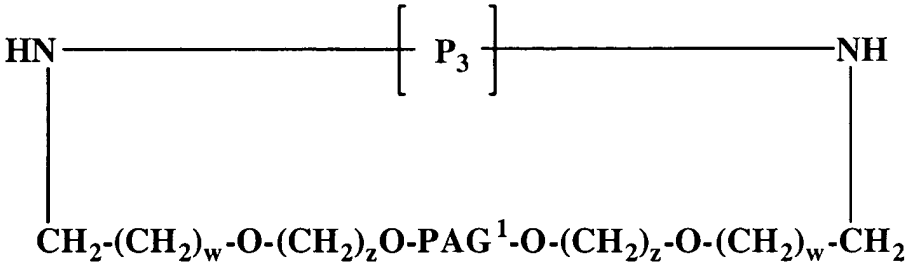
$$P_1HNCH_2\text{-}(CH_2)_w\text{-}O\text{-}(CH_2)_zO\text{-}PAG\text{-}O(CH_2)_z\text{-}O\text{-}(CH_2)_w\text{-}CH_2NHP_1$$

IIC

wherein P_1 is a protein residue with its amino group removed, PAG is a divalent residue of poly lower alkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, w is an integer of from 2 to 8, and z is an integer of from 2 to 4.

96. The conjugate of claim 95 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

97. A conjugate of the formula:



IICC

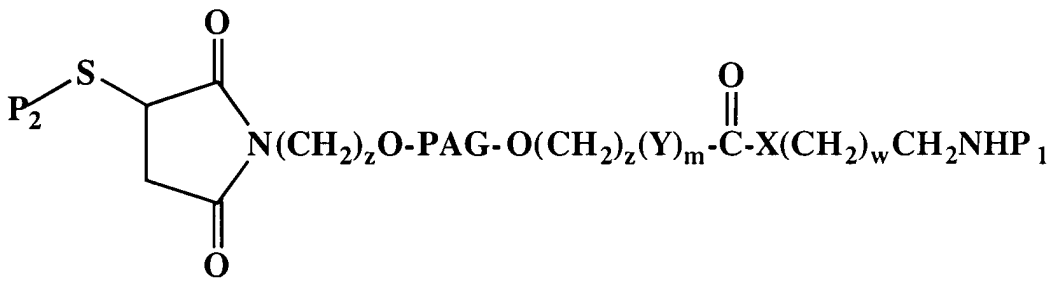
wherein $[P_3]$ is the divalent residue of a protein resulting from removal of two of its primary amino groups, PAG^1 is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a

molecular weight of from 500 to 20,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8.

98. The conjugate of claim 97 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

99. The conjugate of claim 98 where said [P_3] is Hemoglobin.

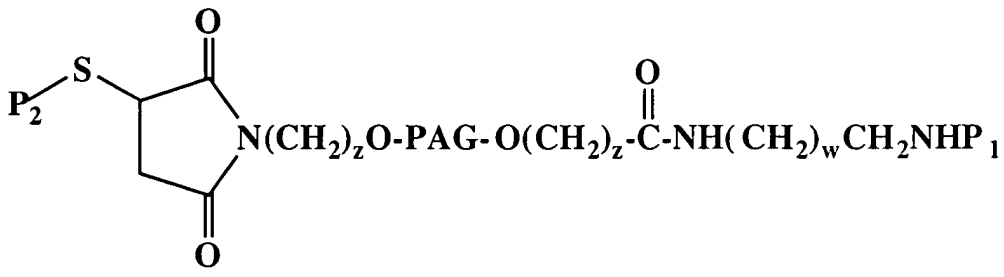
100. A conjugate of the formula:



IID

wherein P_2 is a residue of a protein having its sulfhydryl group removed, P_1 is a residue of a protein having its amino group removed, X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

101. The conjugate of claim 100 where said conjugate has the formula:

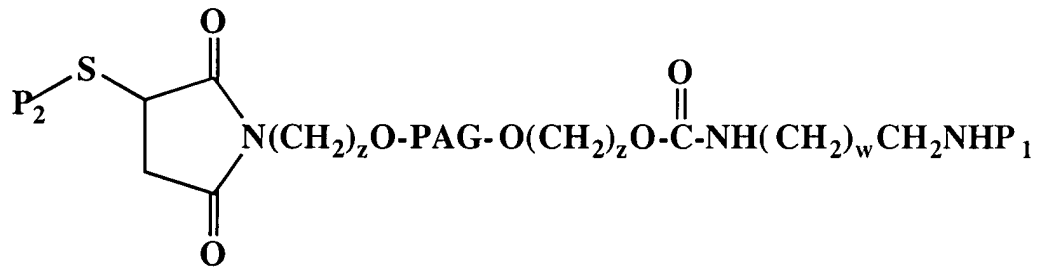


IID-1

wherein P_1, P_2, PAG, z and w are as above.

102. The conjugate of claim 101 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

103. The conjugate of claim 100 where said conjugate has the formula:

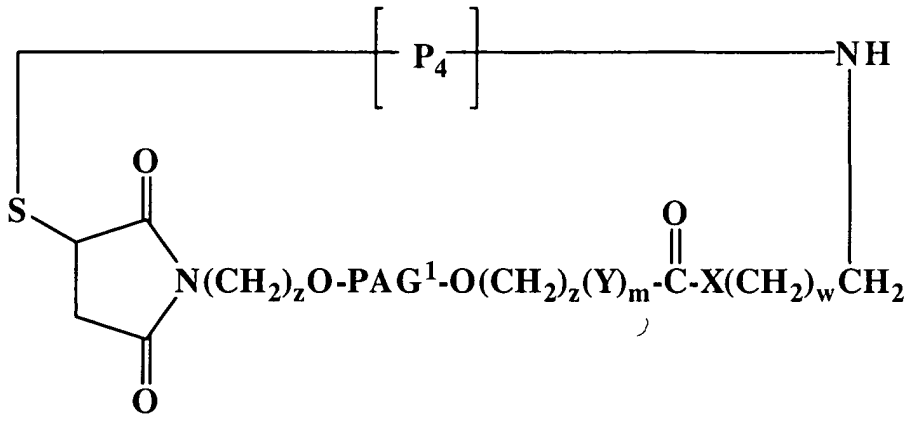


IID-2

wherein P_1, P_2, PAG, z and w are as above.

104. The conjugate of claim 103 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

105. The conjugate of the formula:



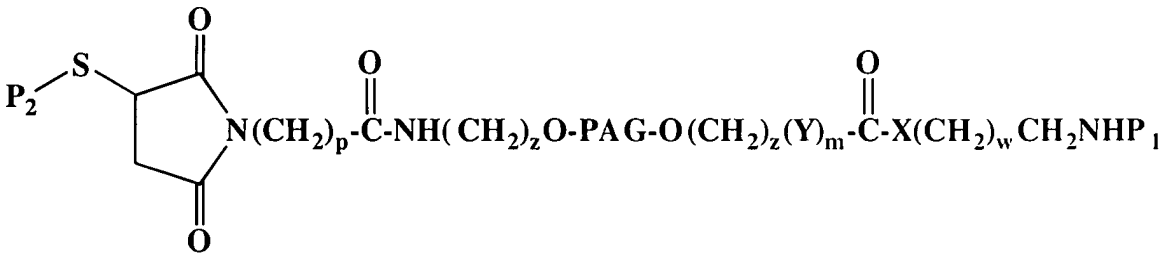
IIDD

wherein $[P_4]$ is the divalent residue of a protein resulting from removal of a primary amino group and a sulfhydryl group, X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG^1 is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 20,000 Daltons, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

106. The conjugate of claim 105 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

107. The conjugate of claim 106 where said $[P_4]$ is Hemoglobin.

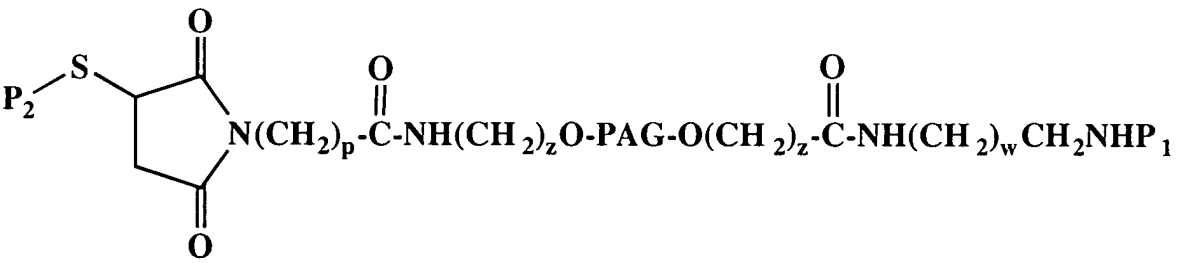
108. The conjugate of the formula:



IIE

wherein P_2 is a residue of a protein having its sulfhydryl group removed, P_1 is a residue of a protein having its amino group removed, X and Y are individually selected from –O - or - NH- with the proviso that X is NH when m is 1 and Y is –O-, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, p is an integer of from 1 to 10, z is an integer of from 2 to 4, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

109. The conjugate of claim 108 where said conjugate has the formula:

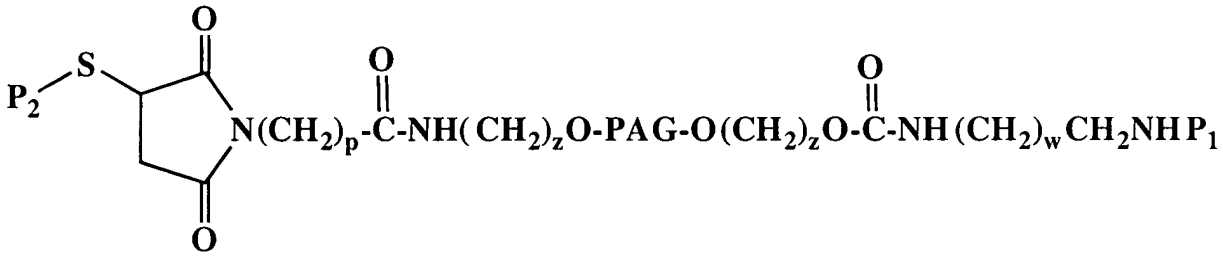


IIE-1

wherein P_1, P_2, PAG, p, z and w are as above.

110. The conjugate of claim 109 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000

111. The conjugate of claim 108 where said conjugate has the formula:

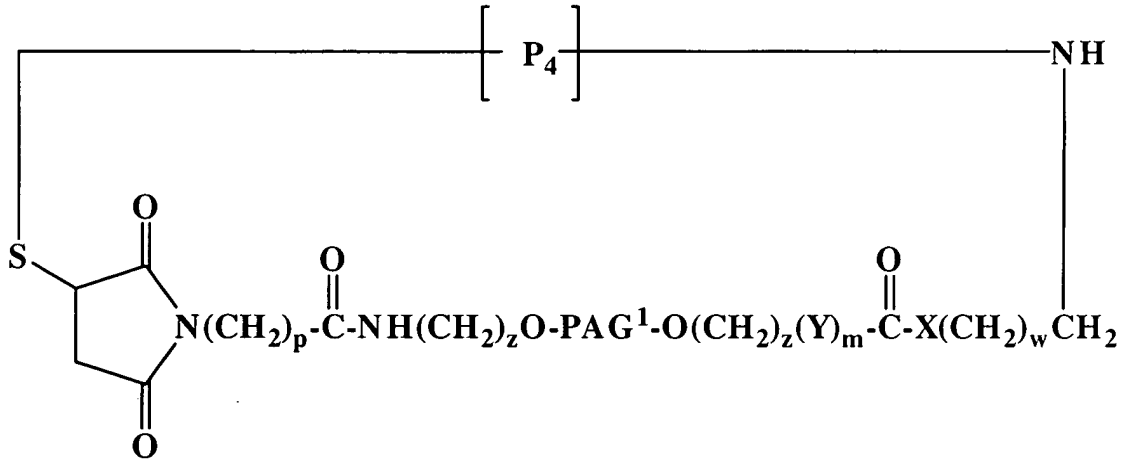


IIE-2

wherein P_1, P_2, PAG, p, z and w are as above.

112. The conjugate of claim 111 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

113. The conjugate of the formula:



IIEE

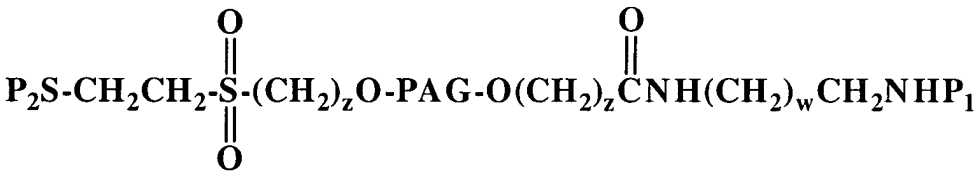
wherein $[P_4]$ is the divalent residue of a protein resulting from removal of a primary amino group and a sulfhydryl group, X and Y are individually selected from –O - or - NH-

with the proviso that X is NH when m is 1 and Y is –O-, PAG[1] is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 20,000 Daltons, p is an integer of from 1 to 10, m is an integer of from 0 to 1, and w is an integer of from 2 to 8.

114. The conjugate of claim 113 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

115. The conjugate of claim 114 where said [P_4] is Hemoglobin.

116. A conjugate of the formula:

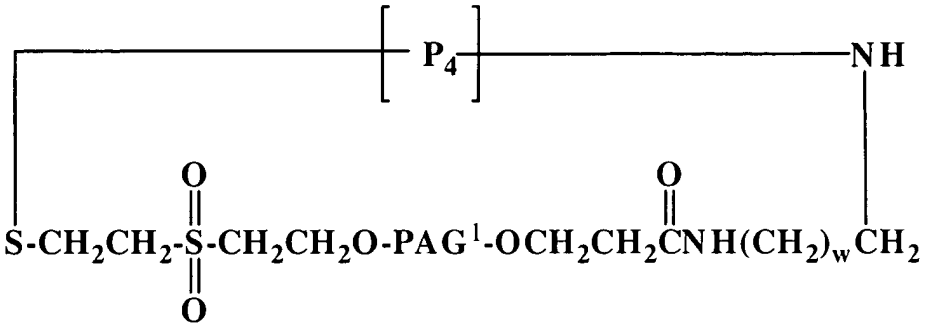


IIF

wherein P_2 is a residue of a protein having its sulfhydryl group removed, P_1 is a residue of a protein having its amino group removed, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8.

117. The conjugate of claim 116 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

118. A conjugate of the formula:



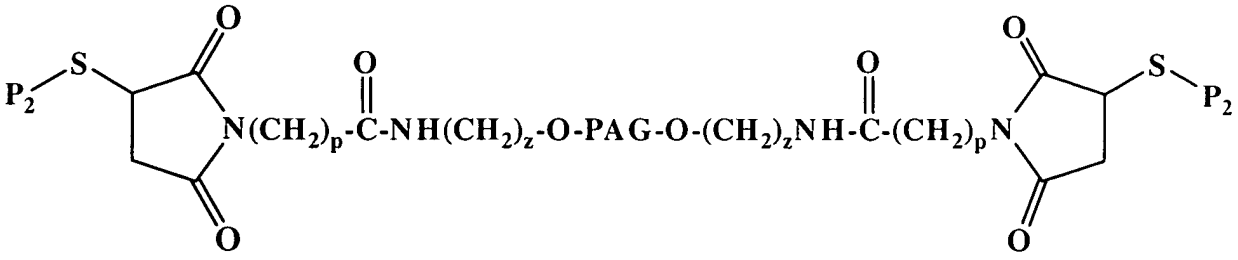
IIFF

wherein $[P_4]$ is the divalent residue of a protein resulting from removal of a primary amino group and a sulfhydryl group, PAG^1 is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 20,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8.

119. The conjugate of claim 118 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

120. The conjugate of claim 119 where said $[P_4]$ is Hemoglobin.

121. A conjugate of the formula:



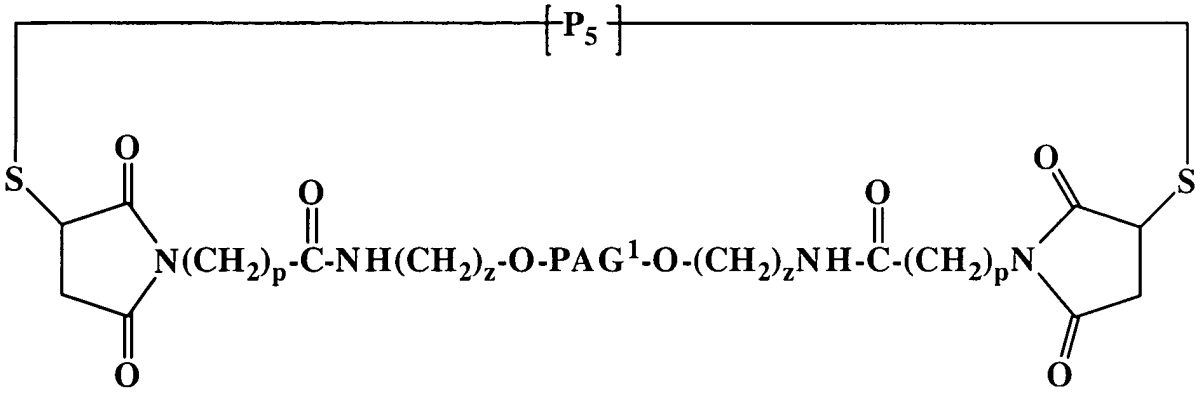
IIG

wherein P_2 is a residue of a protein resulting from removal of a sulfhydryl group, PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, p is an integer of from 1 to 10, and z is an integer of from 2 to 4.

122. The conjugate of claim 121 wherein PAG is formed from polyethylene glycol having a molecular weight of from 5,000 to 50,000.

123. The conjugate of claim 121 wherein the residue has a molecular weight of 500 to 5,000 Daltons.

124. The conjugate of the formula:



IIGG

wherein $[P_5]$ is the divalent residue of a protein resulting from removal of two sulfhydryl groups, PAG^1 is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of

from 500 to 20,000 Daltons, p is an integer of from 1 to 10,

and z is an integer of from 2 to 4.

125. The conjugate of claim 124 wherein PAG is formed from polyethylene glycol having a molecular weight of from 500 to 5,000.

126. The conjugate of claim 125 where said $[P_5]$ is Hemoglobin.

127. A process for producing an aldehyde of the formula:

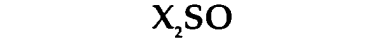
wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8;

from a hydroxy compound of the formula

wherein PAG and z are as above;

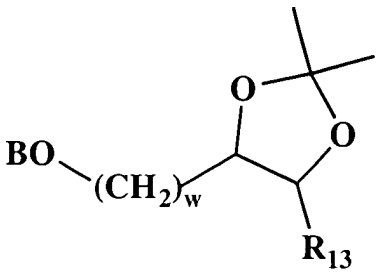
comprising halogenating said hydroxy compound to form a halide of the formula

by reacting said hydroxy compound with a halogenating agent having the formula



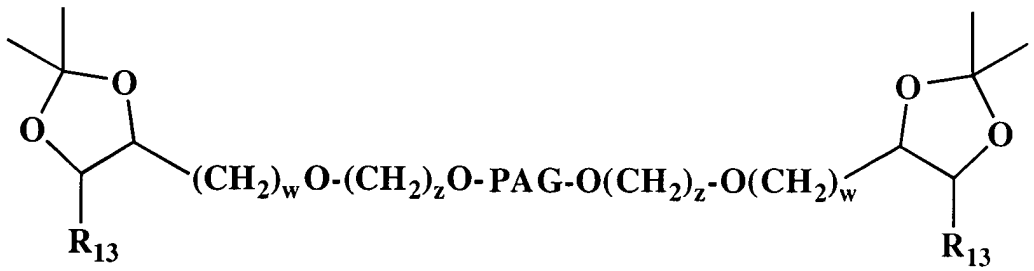
wherein X is a halogen;

to form said halide, and reacting said halide with an alkoxide of the formula



wherein R_{13} is hydrogen, alkyl or phenyl,w is as above and B is an alkali metal salt;

to form a polymeric acetonide of the formula



wherein PAG, R_{13}, and z are as above, and w is an integer of from 2 to 8

and thereafter hydrolyzing said polymeric acetonide under acid conditions to remove the acetonide group, and thereafter subjecting said hydrolyzed acetonide to oxidation with a periodate oxidizing agent to form said dialdehyde.

128. A process for producing an aldehyde of the formula

wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8;

from a hydroxy compound of the formula

wherein PAG and z are as above;

comprising esterifying said hydroxy compound to form an ester of the formula

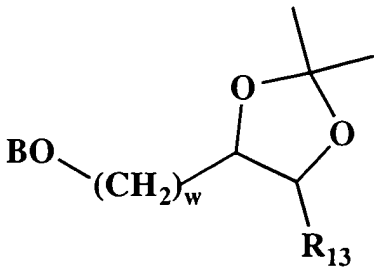
wherein PAG and z are as above and OL is a sulfonate leaving group;

by reacting said hydroxy compound with a sulfonating agent having the formula

HaloL

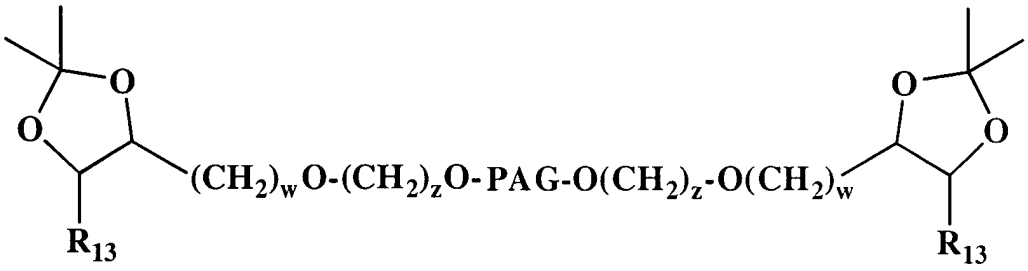
wherein L is a sulfonyl leaving group and Halo is a halogen;

to form said sulfonate ester, and reacting said ester with an alkoxide of the formula



wherein R_{13}, andw are as above and B is an alkali metal salt;

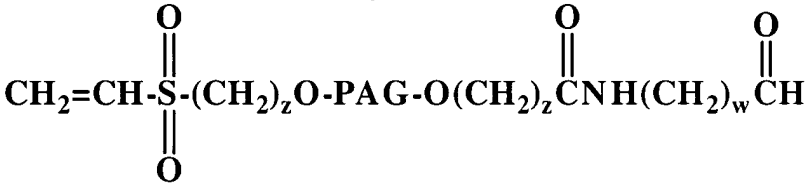
to form a polymeric acetonide of the formula



wherein PAG, R_{13}, z and w are as above;

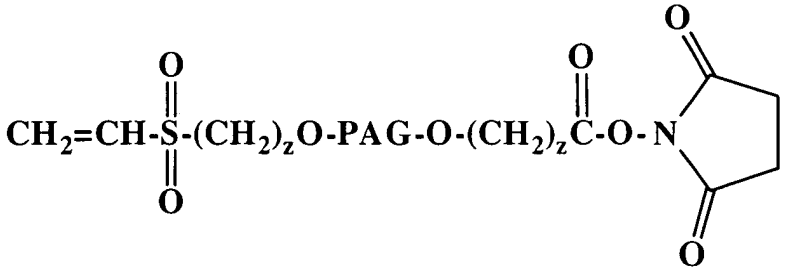
and thereafter hydrolyzing said polymeric acetonide under acid conditions to remove the acetonide group, and thereafter subjecting said hydrolyzed acetonide to oxidation with a periodate oxidizing agent to form said aldehyde.

129. A process for producing an aldehyde of the formula:



wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, and w is an integer of from 2 to 8;

from a vinyl sulfone of the formula

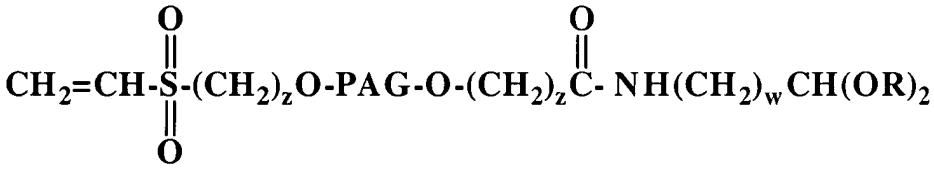


wherein PAG, z and w are as above;

by reacting said sulfone with an amino acetal of the formula

wherein R is lower alkyl and w is as above;

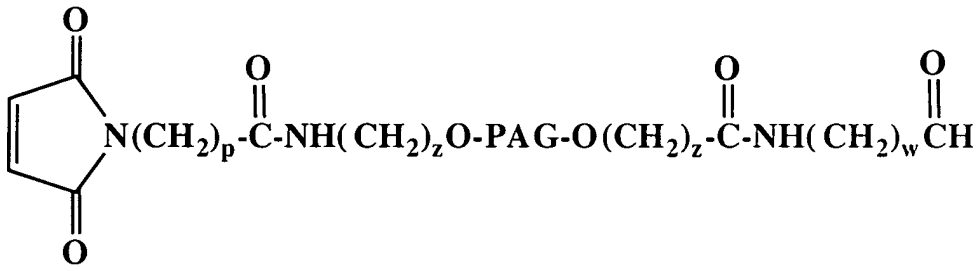
to produce the amide derivative of the formula:



wherein PAG, R and w are as above;

and thereafter hydrolyzing said polymeric acetal under acid conditions to form said aldehyde.

130. A process for producing an aldehyde of the formula



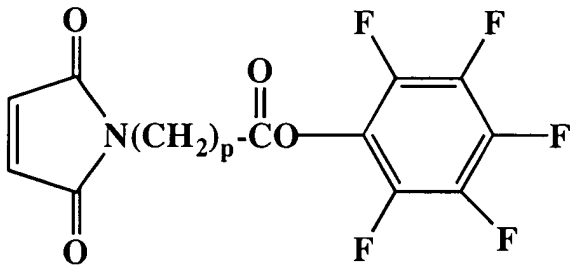
wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, p is an integer of from 1 to 10, and w is an integer of from 2 to 8;

from an amino-carboxy derivative of the formula

$$NH_2(CH_2)_pCOOH$$

wherein p is as above;

by reacting said derivative with maleic anhydride and pentafluorophenyl trifluoroacetate to produce the compound of the formula



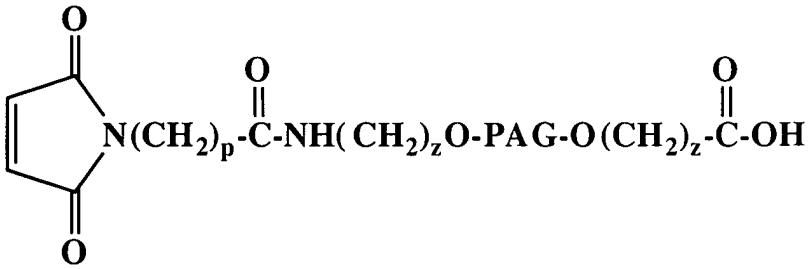
wherein p is as above;

which derivative is conjugated with the compound of the formula

$$H_2N\text{-}(CH_2)_z\text{-}O\text{-}PAG\text{-}O\text{-}(CH_2)_z\text{-}COOH$$

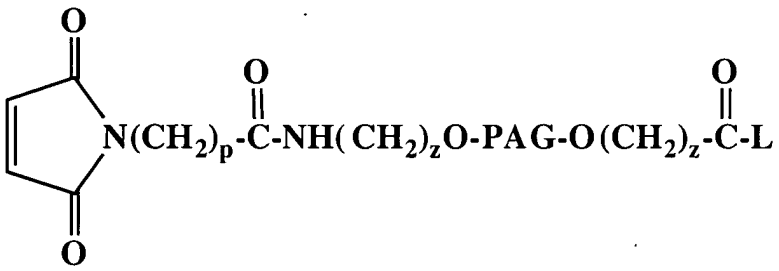
wherein PAG and z are as above;

to form the acid derivative



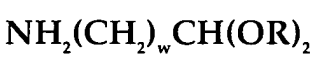
wherein PAG, p and z are as above;

which compound is converted to an active ester whereby L may represent derivatives such as pentafluoro phenol or N-hydroxysuccinimidyl and which compound is described by the formula:



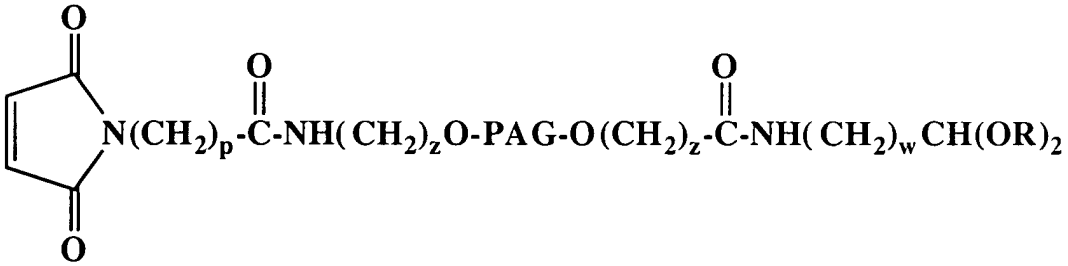
wherein PAG, p and z are as above and L is an active leaving group;

and which compound may be condensed with an acetal such as



wherein R is lower alkyl and w is as above;

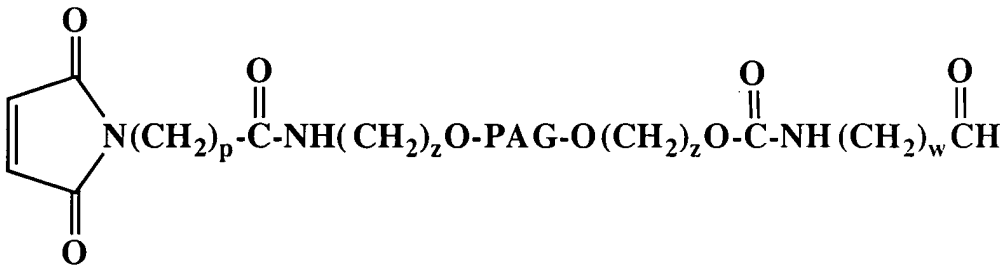
to form the polymeric derivative



wherein PAG, R, p, w and z are as above;

and thereafter hydrolyzing said polymeric acetal under acid conditions to form said aldehyde.

131. A process for producing an aldehyde of the formula:



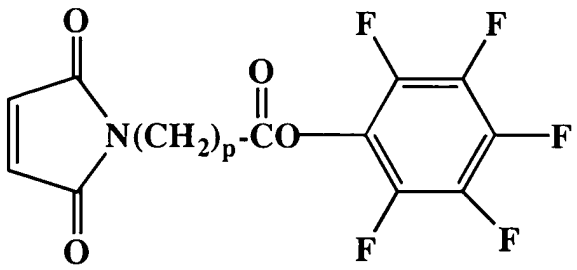
wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, p is an integer of from 1 to 10, and w is an integer of from 2 to 8;

from an amino-acid derivative of the formula

$$NH_2(CH_2)_pCOOH$$

wherein p is as above;

by reacting said derivative with maleic anhydride and pentafluorophenyl trifluoroacetate to produce the compound of the formula



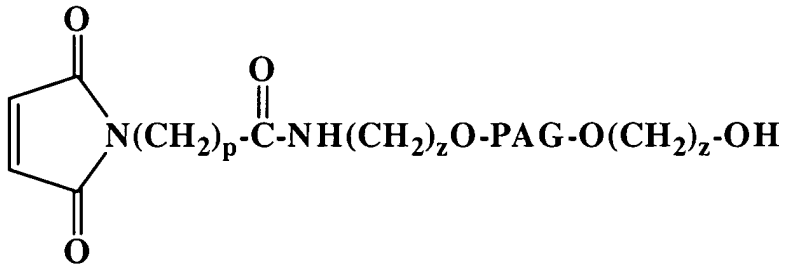
wherein p is as above;

which derivative is conjugated with the compound of the formula

$$H_2N\text{-}(CH_2)_z\text{-}O\text{-}PAG\text{-}O\text{-}(CH_2)_z\text{-}OH$$

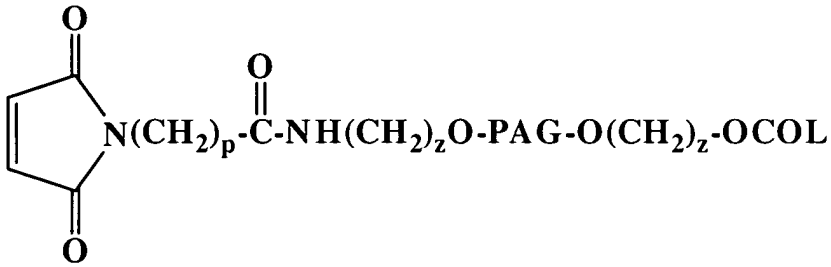
wherein PAG and z are as above;

to form the maleimido-alcohol derivative;



wherein PAG, p and z are as above;

which compound is converted to an active carbonate wherein L may represent such groups as such as p-nitrophenol or N-hydroxysuccinimidyl;



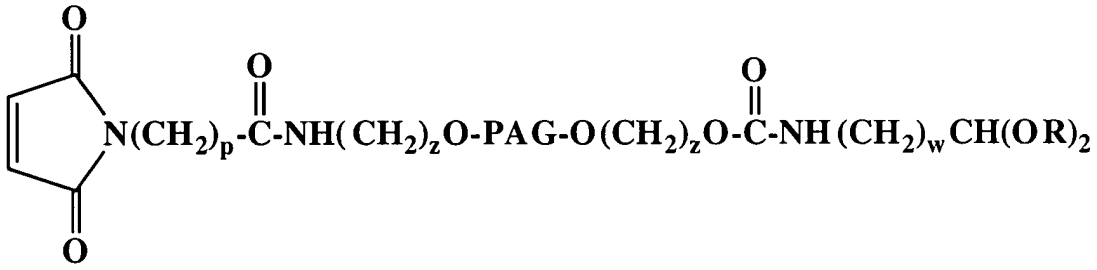
wherein PAG, p and z are as above and L is an active leaving group;

and which compound may then be condensed with an acetal such as

$$NH_2(CH_2)_wCH(OR)_2$$

wherein R is lower alkyl and w is as above;

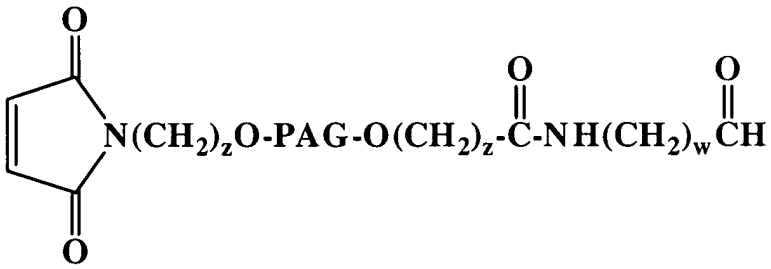
to form the polymeric derivative



wherein PAG, R, p, w and z are as above;

and thereafter hydrolyzing said polymeric acetal under acid conditions to form said aldehyde.

132. A process for producing an aldehyde of the formula:



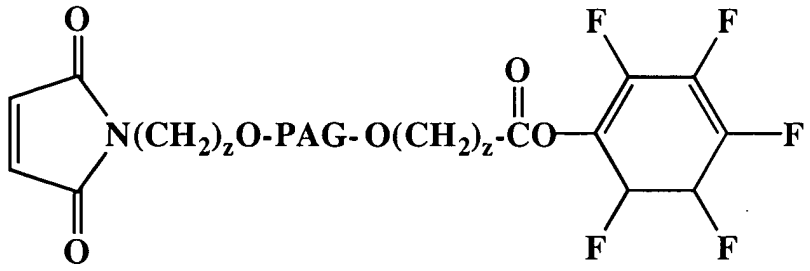
wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8;

from an amino-carboxy derivative of the formula

$$H_2N(CH_2)_z\text{-}O\text{-}PAG\text{-}O\text{-}(CH_2)_zCOOH$$

wherein PAG and z are as above;

by reacting said compound with a mixture of maleic anhydride and pentafluorophenyl trifluoroacetate to form the maleimido ester of the formula



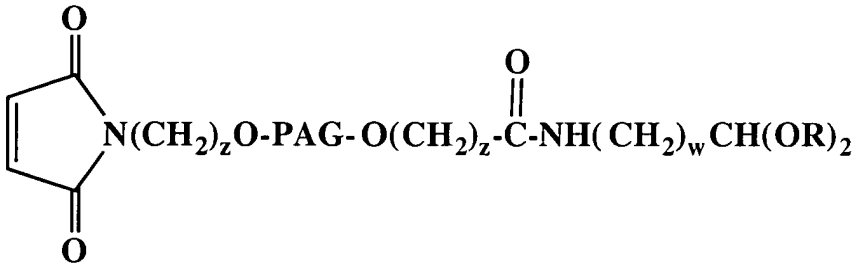
wherein PAG and z are as above;

and reacting said ester with the acetal of the formula

$$NH_2(CH_2)_wCH(OR)_2$$

wherein R is lower alkyl and w is as above;

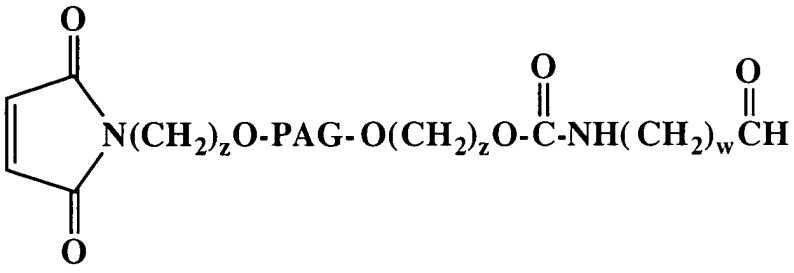
to form the polymeric derivative



wherein PAG, R, w and z are as above;

and thereafter hydrolyzing said polymeric acetal under acid conditions to form said aldehyde.

133. A process for producing an aldehyde of the formula:

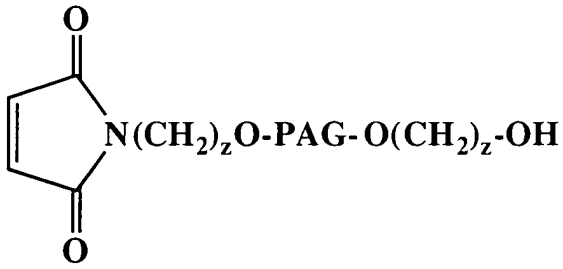


wherein PAG is a divalent residue of polyalkylene glycol resulting from removal of the terminal hydroxy groups and having a molecular weight of from 500 to 100,000 Daltons, z is an integer of from 2 to 4, and w is an integer of from 2 to 8;

by reacting the amino-carboxy derivative of the formula

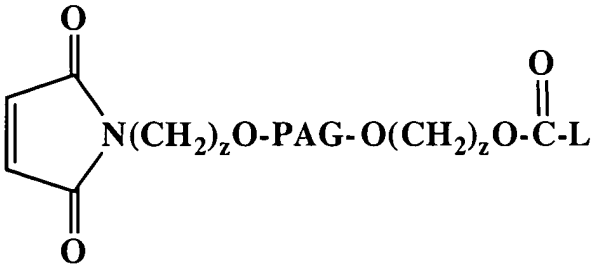
wherein PAG and z are as above;

with a mixture of maleic anhydride and pentafluorophenyl trifluoroacetate to form the maleimido alcohol of the formula



wherein PAG and z are as above;

which compound is converted to an active carbonate wherein L may represent such groups as such as p-nitrophenol or N-hydroxysuccinimidyl;



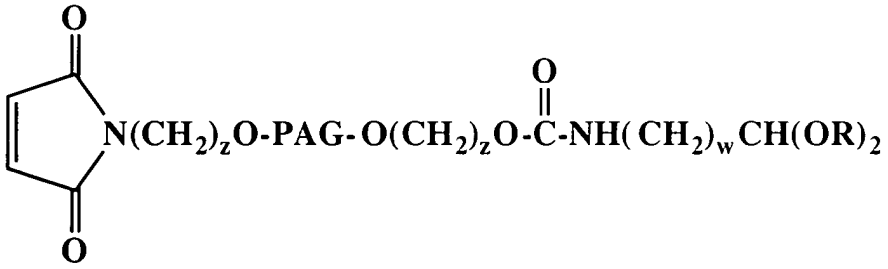
wherein PAG and z are as above and L is an active leaving group;

and which compound may be condensed with an acetal such as

$$NH_2(CH_2)_wCH(OR)_2$$

wherein R is lower alkyl and w is as above;

to form the acetal derivative of formula



wherein PAG, R, w and z are as above;

and thereafter hydrolyzing said polymeric acetal under acid conditions to form said aldehyde.